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more abundantly in the upper parts of the trees, and are the cause of increased sap concentration. Any agreement between observed increments of osmotic pressure and theoretical values calculated from the increased hydrostatic head and resistance to be overcome in the tracheae by virtue of higher position is regarded as a coincidence, and not as a proof of adjustment on the part of the cells to the back pull of increased head and resistance.—CHARLES A. SHULL.

**Antagonism.**—Antagonism between iron and manganese in their effects on the growth of two varieties of wheat has been investigated by TOTTINGHAM and BECK.<sup>14</sup> Manganous chloride in water cultures even in low concentrations reduces root growth, but when ferric chloride is added in about equimolecular ( $0.00001M$ ) concentration the deleterious effects of the manganous salt are overcome. The two varieties of wheat used did not give exactly the same results, and it is believed that effects will depend on variety to a certain extent. Thus the amount of reserve iron in the seed would influence the response of the plant to variations in supply of salts of these two metals. In very dilute solutions the manganous chloride seemed to have stronger effects than ferric chloride on the color and growth, while in higher concentrations ( $0.001M$ ) the iron salt had more effect than the manganese. Although the concentrations used approach that of these salts in the soil solution, no conclusions as to antagonism in soil cultures can be drawn because of the great variety of other salts and conditions which might modify the result.

SKINNER<sup>15</sup> has studied the effects of manganese sulphate and some other inorganic substances in overcoming the unfavorable action of vanillin and salicylic aldehyde on plants grown in culture solutions of varying composition. He finds that vanillin reduces the growth of cow peas, but the presence of nitrate reduces the unfavorable action, and may even entirely overcome the reduction of growth caused by vanillin. The harmful effects of salicylic aldehyde in 5 and 10 ppm. concentrations on wheat seedlings were entirely overcome by manganese sulphate in 10 ppm. concentration; and the harmfulness of vanillin was also partially overcome by manganese sulphate. He explains the action of nitrate and manganese on the ground that they favor root oxidation, whereby the harmful organic compounds are oxidized and are not permitted to influence growth unfavorably.—CHARLES A. SHULL.

**The embryo sac of Aster and Solidago.**—These much investigated embryo sacs have been studied again, this time by PALM,<sup>16</sup> a pupil of ROSENBERG.

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<sup>14</sup> TOTTINGHAM, W. E., and BECK, A. J., Antagonism between manganese and iron in the growth of wheat. *Plant World* **19**:359-370. 1916.

<sup>15</sup> SKINNER, J. J., The effect of vanillin and salicylic aldehyde in culture solution and the action of chemicals in altering their influence. *Plant World* **19**:371-378. 1916.

<sup>16</sup> PALM, B.J., Zur Embryologie der Gattungen *Aster* und *Solidago*. *Acta Horti Bergianii* **5**:1-18. figs. 27. 1914.